<u>GENERAL:</u>

- A. THE DDC CONTROLS FOR THIS PROJECT SHALL BE CONNECTED TO THE EXISTING JOHNSON CONTROLS INCORPORATED SYSTEM USER INTERFACE. THE CONTROLS WORK SHALL INCLUDE PROVIDING GRAPHICS FOR THE NEW SYSTEMS AND MODIFIED SYSTEM IN THE SCOPE OF THIS PROJECT.
- B. THE DDC CONTROL INTERFACE SHALL PROVIDE FULL OVERRIDE CAPABILITY OF ALL CONTROL OUTPUTS.
- C. THE DDC CONTROL INTERFACE SHALL PROVIDE HIGH AND LOW ALARMS AS APPLICABLE FOR ALL INDICATED CONTROL
- D. ALL THIRD PARTY CONTROLS SUCH AS CHILLER CH-3, VARIABLE FREQUENCY DRIVES AND THE SPS PRESSURE AND TEMPERATURE CONTROLS SHALL BE INTEGRATED THROUGH THE DDC CONTROL SYSTEM INTO THE EXISTING USER INTERFACE TO INCLUDE GRAPHICS DISPLAY, DATA DISPLAY, AND SETPOINT ADJUSTMENTS AND OUTPUT OVERRIDES.
- E. ALL SETPOINTS, OPERATING SCHEDULES, RESET SCHEDULE AND TIME DELAYS SHALL BE USER ADJUSTABLE THROUGH THE CONTROL SYSTEM USER INTERFACE.
- ALL LEAD / LAG EQUIPMENT INCLUDING FANS. PUMPS AND CHILLERS SHALL ALTERNATE ON A WEEKLY BASIS TO MAINTAIN OPERATING HOURS OF ALL EQUIPMENT WITHIN 168 HOURS OF EACH OTHER. CHANGE OVER SHALL TAKE PLACE AT 7:00 A.M. AFTER RUN TIME DIFFERENCE EXCEEDS 168 HOURS.
- SEQUENCE OF CONTROL FOR AH-1-4SRF-1
- A. SUPPLY FAN OPERATING, AND SAFETY CONTROLS SHALL INCLUDE:
- WALL MOUNTED DISCONNECT
- VARIABLE FREQUENCY MOTOR SPEED CONTROL DRIVE (VFD)(ONE VFD CONTROLLING TWO SUPPLY FANS)
- 3. SUPPLY AIR SMOKE DETECTOR
- 4. FREEZE PROTECTION THERMOSTAT
- 5. GENERAL FIRE ALARM SYSTEM RELAY
- DUCT SUPPLY HIGH LIMIT PRESSURE SWITCH 7. DUCT EXHAUST LOW LIMIT PRESSURE SWITCH
- B. THE HIGH AND LOW LIMIT PRESSURE SWITCHES, SMOKE DETECTOR, FREEZE PROTECTION THERMOSTAT AND FIRE ALARM RELAY SHALL BE HARD WIRED IN THE FAN MOTOR CONTROL CIRCUIT AND SHALL SEND A SIGNAL FROM AN AUXILIARY CONTACT TO THE DDC CONTROL SYSTEM. IN ADDITION, THE SMOKE DETECTORS SHALL SEND A SIGNAL TO THE BUILDING FIRE ALARM SYSTEM.
- C. WITH THE SAFETY CONTROLS IN THE NORMAL POSITION AND THE VFD IN THE AUTO POSITION THE FAN MOTOR SHALL OPERATE AT ALL TIMES.
- D. SUPPLY FAN AND CONTROLS INTERLOCK: WHENEVER THE SUPPLY FAN IS OFF AS INDICATED BY NO AIRFLOW, ALL CONTROL ACTUATORS SHALL BE PLACED IN THEIR NORMAL POSITION.
- E. SUPPLY FAN SPEED CONTROL:
- 1. DURING SCHEDULED SPS OCCUPIED TIMES THE DDC SYSTEM SHALL MODULATE THE VFD OUTPUT TO MAINTAIN SUPPLY DUCT STATIC PRESSURE AT THE OCCUPIED MODE STATIC PRESSURE SETPOINT.
- 2. DURING SCHEDULED SPS UNOCCUPIED TIMES THE DDC SYSTEM SHALL MODULATE THE VFD OUTPUT TO MAINTAIN SUPPLY DUCT STATIC PRESSURE AT THE UNOCCUPIED MODE STATIC PRESSURE SETPOINT.
- THE OCCUPIED AND UNOCCUPIED STATIC PRESSURE SETPOINTS SHALL BE DETERMINED BY THE TAB CONTRACTOR DURING TAB WORK.
- HEAT RECOVERY SYSTEM
- 1. THE DDC CONTROL SYSTEM SHALL PUT THE HEAT EXCHANGER FACE AND BYPASS DAMPER IN THE FACE
- POSITION WHEN OUTSIDE AIR TEMPERATURE IS 75 F OR HIGHER FOR 5 MINUTES OR LONGER. THE DDC CONTROL SYSTEM SHALL PUT THE HEAT EXCHANGER FACE AND BYPASS DAMPER IN THE FACE POSITION WHENEVER OUTSIDE AIR TEMPERATURE IS 53 F OR LOWER FOR 5 MINUTES OR LONGER.
- THE DDC CONTROL SYSTEM SHALL PUT THE HEAT EXCHANGER FACE AND BYPASS DAMPER IN THE BYPASS POSITION WHEN OUTSIDE AIR TEMPERATURE IS BETWEEN 54 F AND 74 F FOR 5 MINUTES OR LONGER
- G. HEATING AND COOLING COILS: THE CONTROL SYSTEM SHALL MODULATE THE HEATING AND COOLING COIL CONTROLS IN SEQUENCE TO MAINTAIN SUPPLY AIR TEMPERATURE ACCORDING TO THE FOLLOWING SCHEDULE HEATING COIL DISCHARGE TEMPERATURE 53 F
- H. THE IFB PREHEAT COIL CONTROLS SHALL BE TWO POSITION CONTROL ON THE STEAM VALVE AND PID MODULATION OF THE IFB DAMPER.
- HUMIDIFIER CONTROL:
- 1. THE CONTROL SYSTEM SHALL MODULATE THE HUMIDIFIER STEAM VALVE TO MAINTAIN EXHAUST AIR RELATIVE HUMIDITY AT 25%.
- 2. THE HIGH LIMIT HUMIDISTAT SHALL SHUTOFF THE HUMIDIFIER STEAM VALVE ANY TIME THE HUMIDITY IN THE SUPPLY AIR DUCT EXCEEDS 70%.
- 3. THE CONTROL SYSTEM SHALL ALARM THE USER INTERFACE ANYTIME EXHAUST AIR HUMIDITY IS BELOW 20%.
- RESPOND AS FOLLOWS:

K. FILTER MONITORING: THE CONTROL SYSTEM SHALL MONITOR AIR PRESSURE DROP ACROSS THE FILTERS AND

- 1. ALARM WHEN FILTER PRESSURE DROP EXCEEDS MANUFACTURER'S LIMIT. LIMIT TO BE DETERMINED FROM FILTER AND AIR HANDLING UNIT SUBMITTALS AND UPDATED IN CONTROL CONTRACTOR'S SEQUENCE OF CONTROL.
- 2. ALARM WHEN FILTER PRESSURE DROP INDICATES THAT A FILTER IS MISSING FROM THE RACK. SETPOINT PRESSURE TO BE DETERMINED DURING TEST AND BALANCE BY REMOVAL OF A FILTER FROM THE RACK.
- ALARMS: THE CONTROL SYSTEM SHALL ALARM THE USER INTERFACE AND TAKE THE INDICATED ACTIONS WHENEVER ANY OF THE FOLLOWING CONDITIONS OCCURS:
- PREHEAT COIL AIR TEMPERATURE NOT AT SETPOINT FOR 5 MINUTES OR LONGER.
- 2. COOLING COIL LEAVING AIR TEMPERATURE NOT AT SETPOINT FOR FIVE MINUTES OR LONGER.
- EXHAUST AIR HUMIDITY NOT AT SETPOINT FOR 15 MINUTES OR LONGER. 4. SUPPLY DUCT STATIC PRESSURE NOT AT SETPOINT FOR 5 MINUTES OR LONGER.
- III. <u>SEQUENCE OF CONTROL FOR SPD GENERAL EXHAUST FANS EF-1-4SRF-8/-9</u>
- A. EXHAUST FAN OPERATING AND SAFETY CONTROLS SHALL INCLUDE

COOLING COIL DISCHARGE TEMPERATURE 52 F

- WALL MOUNTED DISCONNECT HAND-OFF-AUTO SELECT SWITCH
- MOTOR CURRENT TRANSDUCER
- EXHAUST AIR SMOKE DETECTOR
- EXHAUST AIR STATIC PRESSURE SENSOR
- 6. BYPASS DAMPER AND DAMPER ACTUATOR

- B. THE SMOKE DETECTOR AND DUCT HIGH AND LOW LIMIT PRESSURE SWITCHES SHALL BE HARD WIRED INTO THE FAN CONTROL SYSTEM AND SHALL SEND A SIGNAL TO THE DDC CONTROL SYSTEM. THE SMOKE DETECTOR SHALL ALSO SEND A SIGNAL TO THE FIRE ALARM.
- C. WITH THE SAFETY CONTROLS IN THE NORMAL POSITION THE EXHAUST FAN SHALL OPERATE AT ALL TIMES ON A LEAD / LAG BASIS.
- D. THE CONTROL SYSTEM SHALL ROTATE LEAD / LAG FANS ON A WEEKLY BASIS (168 HOURS) TO MAINTAIN EQUAL
- RUN TIMES ON BOTH FANS. E. UPON FAILURE OF THE LEAD FAN AS DETERMINED BY THE MOTOR CURRENT TRANSDUCER BEING OFF SETPOINT THE
- F. THE CONTROL SYSTEM SHALL MODULATE THE FAN BYPASS DAMPER TO MAINTAIN EXHAUST DUCT STATIC PRESSURE AT SETPOINT AND FAN CFM CONSTANT.

CONTROL SYSTEM SHALL START THE LAG FAN, DISABLE THE WEEKLY LEAD / LAG CHANGE OVER AND SHALL ALARM

- G. THE CONTROL SYSTEM SHALL ADJUST THE EXHAUST DUCT STATIC PRESSURE SETPOINT TO EITHER OCCUPIED SETPOINT OR UNOCCUPIED SETPOINT. CONSULT THE COR FOR THE INITIAL OCCUPIED / UN-OCCUPIED SCHEDULE FOR THIS FUNCTION.
- H. THE OCCUPIED AND UNOCCUPIED STATIC PRESSURE SETPOINTS SHALL BE DETERMINED BY THE TAB CONTRACTOR DURING TAB WORK SO THAT UNOCCUPIED FLOW IS 50% OF OCCUPIED FLOW.
- J. ALARMS: THE CONTROL SYSTEM SHALL ALARM THE USER INTERFACE AND TAKE INDICATED ACTION WHENEVER ANY OF THE FOLLOWING CONDITIONS OCCURS:
- 1. MOTOR CURRENT PLUS OR MINUS 10% OF FULL LOAD AMPS FOR 10 SECONDS OR LONGER. FULL LOAD CURRENT SHALL BE AS DETERMINED DURING TEST AND BALANCE. STOP LEAD FAN AND TURN ON LAG FAN.
- 2. NO AIR FLOW FOR 5 SECONDS OR LONGER. STOP LEAD FAN AND TURN ON LAG FAN 3. EXHAUST PRESSURE NOT AT SETPOINT FOR 30 SECONDS OR LONGER. STOP LEAD FAN AND TURN ON LAG
- 4. WHEN THE EXHAUST FAN IS OPERATING IN MANUAL OVERRIDE AS DETERMINED BY FAN OPERATION OUTSIDE THE CONTROL OF THE CONTROL SYSTEM. THE ALARM SHALL TOTALIZE THE MINUTES OF MANUAL OVERRIDE
- IV. <u>SEQUENCE OF CONTROL FOR SPD WET EXHAUST FAN EF-1-4SRF-3</u>
- A. EXHAUST FAN OPERATING AND SAFETY CONTROLS SHALL INCLUDE
- WALL MOUNTED DISCONNECT

THE CONTROL SYSTEM USER INTERFACE.

HAND-OFF-AUTO SELECT SWITCH

B. THE EXHAUST FAN SHALL OPERATE AT ALL TIMES.

- MOTOR CURRENT TRANSDUCER
- C. ALARMS: ALARM THE USER INTERFACE IF FAN MOTOR CURRENT IS PLUS OR MINUS 10% OF FULL LOAD AMPS FOR 10 SECONDS OR LONGER.
- V. SPS AIRFLOW VALVES AND REHEAT COILS SEQUENCE OF CONTROLS
- A. THE CRITICAL SPACE AIRFLOW VALVE AND REHEAT COIL CONTROLS SHALL BE ACCOMPLISHED BY A DEDICATED CRITICAL SPACE PRESSURE AND TEMPERATURE CONTROL SYSTEM.
- THE DDC SYSTEM CONTROLS CONTRACTOR AND CRITICAL SPACE CONTROLS CONTRACTOR SHALL WORK TOGETHER TO ENSURE THAT THE CRITICAL SPACE CONTROLS SYSTEM IS FULLY INTEGRATED INTO THE EXISTING USER INTERFACE USED FOR THE REST OF THE WORK OF THIS PROJECT. THE INTEGRATION REQUIREMENTS TABLE IS SHOWN ON SHEET M801. THE DDC SYSTEM USER INTERFACE SHALL ALARM WHEN ROOM TEMPERATURE AND / OR PRESSURE ARE OUT OF TOLERANCE.
- C. A WALL MOUNTED DIFFERENTIAL PRESSURE SENSOR SHALL INTERFACE WITH THE CRITICAL ROOM CONTROLLER AND GENERATE A LOCAL AND A REMOTE ALARM WHEN SPACE PRESSURE IS NOT POSITIVE OR NEGATIVE AS REQUIRED BY THE SPECIFIC ROOM APPLICATION.
- D. THE CRITICAL SPACE CONTROLS SHALL OPERATE THE REHEAT COIL CONTROL VALVES TO MAINTAIN SPACE TEMPERATURE AT SETPOINT. THE CONTROL SYSTEM SHALL GENERATE A LOCAL AND A REMOTE ALARM WHEN SPACE TEMPERATURE IS OUT OF TOLERANCE.
- E. THE CRITICAL SPACE CONTROLS SHALL MAINTAIN FULL SCHEDULED SUPPLY AND EXHAUST AIR FLOW IN THE SPACES DURING SCHEDULED OCCUPIED TIMES AND DURING OVERRIDE OCCUPIED TIMES.
- F. THE CRITICAL SPACE CONTROLS SHALL MAINTAIN THE MINIMUM SCHEDULED SUPPLY AND EXHAUST AIR FLOWS IN THE SPACES DURING SCHEDULED UN-OCCUPIED TIMES.
- G. SPACE TEMPERATURE SETPOINT DURING OCCUPIED MODE SHALL BE USER ADJUSTABLE TO PLUS 3 DEGREES F AND MINUS 3 DEGREES F ABOVE AND BELOW 70°F SOFTWARE ADJUSTABLE SETPOINT. SPACE TEMPERATURE SETPOINT SHALL BE 65°F DURING SETBACK MODE FOR HEATING. THE COOLING TEMPERATURE SHALL NOT BE SETBACK.
- H. THE CONTROL SYSTEM SHALL RESET THE TERMINAL'S SUPPLY AIR SETPOINT TO EITHER MAXIMUM FLOW OR MINIMUM FLOW. MAXIMUM FLOW OCCURS DURING OCCUPIED PERIOD AND MINIMUM FLOW OCCURS DURING UNOCCUPIED PERIOD. CONTACT COR FOR COPY OF INITIAL TIME SCHEDULE.
- J. THE USER OVERRIDE SELECT BUTTON AND DISPLAY SHALL ALLOW SPS PERSONAL TO CHANGE OPERATION FROM UNOCCUPIED TO OCCUPIED FOR AN ADJUSTABLE TIME PERIOD OF 4 HOURS.
- VI. OTHER SPD CONTROL FUNCTIONS
- A. THE CONTROL SYSTEM SHALL MONITOR DIFFERENTIAL PRESSURE BETWEEN INDICATED SPACES AND SHALL ALARM THE USER INTERFACE AND PRODUCE A LOCAL SOUND ALARM ANY TIME THE DIFFERENTIAL PRESSURE FALLS BELOW 0.05 INCHES OF WATER FOR 20 SECONDS OR LONGER.
- THE CONTROL SYSTEM SHALL MONITOR DIFFERENTIAL PRESSURE BETWEEN INDICATED SPACES AND SHALL ALARM THE USER INTERFACE AND PRODUCE A LOCAL SOUND ALARM ANY TIME THE DIFFERENTIAL PRESSURE REVERSES FROM REQUIRED DIRECTION FOR 5 SECONDS OR LONGER.
- C. THE COOLING ONLY FAN COIL UNIT IN THE EQUIPMENT WASH ROOM SHALL BE CONTROLLED BY ITS OWN WALL MOUNTED THERMOSTAT. THE THERMOSTAT SHALL CYCLE THE SUPPLY FAN AND MODULATE THE CHILLED WATER VALVE IN SEQUENCE TO MAINTAIN ROOM TEMPERATURE AT THE COOLING SETPOINT.

- D. THE CONTROL SYSTEM SHALL MONITOR TEMPERATURE IN THE EQUIPMENT WASH ROOM AND SHALL ALARM THE USER INTERFACE ANYTIME THE SPACE TEMPERATURE IS HIGHER THAN 80 F OR LOWER THAN 70 F
- VII. <u>SEQUENCE OF CONTROL FOR AH-1-4SRF-2</u>
- A. SUPPLY FAN OPERATING, AND SAFETY CONTROLS SHALL INCLUDE:
- 1. WALL MOUNTED DISCONNECT
- VARIABLE FREQUENCY MOTOR SPEED CONTROL DRIVE (VFD)(TOTAL OF TWO VFD'S WITH EACH VFD CONTROLLING
- TWO SUPPLY FANS RETURN AIR SMOKE DETECTOR
- 4. SUPPLY AIR SMOKE DETECTOR
- FREEZE PROTECTION THERMOSTAT
- 6. GENERAL FIRE ALARM SYSTEM RELAY SUPPLY DUCT HIGH AND RETURN DUCT LOW LIMIT PRESSURE SWITCHES
- B. RETURN FAN OPERATING. AND SAFETY CONTROLS SHALL INCLUDE:
- 1. WALL MOUNTED DISCONNECT
- 2. VARIABLE FREQUENCY MOTOR SPEED CONTROL DRIVE (VFD)(TOTAL OF TWO VFD'S WITH EACH VFD CONTROLLING
- TWO RETURN FANS
- RETURN AIR SMOKE DETECTOR 4. SUPPLY AIR SMOKE DETECTOR
- 5. FREEZE PROTECTION THERMOSTAT

TO THE BUILDING FIRE ALARM SYSTEM.

- 6. GENERAL FIRE ALARM SYSTEM RELAY 7. SUPPLY DUCT HIGH AND RETURN DUCT LOW LIMIT PRESSURE SWITCHES
- C. THE DUCT HIGH AND LOW LIMIT PRESSURE SWITCHES, SMOKE DETECTORS, FREEZE PROTECTION THERMOSTAT, AND FIRE ALARM RELAY SHALL BE HARD WIRED IN THE FAN MOTOR CONTROL CIRCUIT AND SHALL SEND A SIGNAL FROM AN AUXILIARY CONTACT TO THE DDC CONTROL SYSTEM. IN ADDITION, THE SMOKE DETECTORS SHALL SEND A SIGNAL
- D. WITH THE SAFETY CONTROLS IN THE NORMAL POSITION AND THE VFD IN THE AUTO POSITION THE FAN MOTORS SHALL OPERATE DURING RADIOLOGY OCCUPIED HOURS. IF DURING UN-OCCUPIED HOURS ANY SPACE TEMPERATURE FALLS TO 64 F (ADJUSTABLE) OR RISES TO 85 F (ADJUSTABLE) THE FANS SHALL RESTART AND THE SYSTEM SHALL
- E. THE CONTROL SYSTEM SHALL TURN ON THE AIR SYSTEM AHEAD OF MORNING OCCUPANCY TO ENSURE ALL SPACES ARE AT OCCUPIED SETPOINT AT THE BEGINNING OF THE DAY'S SCHEDULE.
- F. FAN AND CONTROLS INTERLOCK: WHENEVER THE FANS ARE OFF AS INDICATED BY NO AIRFLOW, ALL CONTROL ACTUATORS SHALL BE PLACED IN THEIR NORMAL POSITION.

OPERATE UNTIL ALL SPACES TEMPERATURES ARE BETWEEN 65 F AND 84 F (ADJUSTABLE).

- G. SUPPLY FAN SPEED CONTROL:
- 1. THE DDC SYSTEM SHALL MODULATE THE VFD OUTPUT TO MAINTAIN SUPPLY DUCT STATIC PRESSURE AT
- THE CONTROL SYSTEM SHALL RESET THE SUPPLY DUCT STATIC PRESSURE SETPOINT BASED ON THE POSITION OF THE VAV TERMINAL DAMPERS. EVERY 15 MINUTES (ADJUSTABLE) THE CONTROL SYSTEM SHALL LOWER THE SETPOINT BY 5% (ADJUSTABLE) IF AT LEAST ONE TERMINAL IS AT MINIMUM POSITION AND NO TERMINALS ARE FULLY OPEN. IF AT LEAST ONE TERMINAL IS FULLY OPEN THE CONTROL SYSTEM SHALL INCREASE THE SETPOINT BY 5% (ADJUSTABLE).
- H. MIXED AIR SECTION AND RETURN FAN CONTROL
- 1. THE MIXED AIR SECTION SHALL OPERATE IN UNOCCUPIED / RE-THERM MODE, MINIMUM OUTSIDE AIR MODE OR ECONOMIZER MODE.
- 2. UNOCCUPIED / RE-THERM MODE OCCURS WHEN THE UNIT HAS TO RUN TO MAINTAIN UN-OCCUPIED SPACE TEMPERATURES BETWEEN 65 F AND 84 F AND TO BRING THE SPACES TO OCCUPIED TEMPERATURE PRIOR TO MORNING OCCUPANCY. DURING ALL OF THESE CONDITIONS THE OUTSIDE AIR AND RELIEF DAMPERS SHALL BE 100% CLOSED AND THE RETURN DAMPER SHALL BE 100% OPEN. WHEN IN MINIMUM OUTSIDE AIR MODE THE CONTROL SYSTEM SHALL PLACE THE MIXED AIR DAMPERS IN THEIR
- MINIMUM OUTSIDE AIR MODE POSITION AND SHALL MODULATE THE RETURN FAN SPEED TO MAINTAIN THE MIXED AIR SECTION STATIC PRESSURE AT SETPOINT. 4. THE TAB CONTRACTOR SHALL DETERMINE AND CALIBRATE THE MIXED AIR SECTION DAMPERS MINIMUM OUTSIDE AIR MODE POSITIONS AND MIXED AIR SECTION STATIC PRESSURE SETPOINT SUCH THAT THE PRESSURE CAN BE
- MAINTAINED THROUGH THE FULL RANGE OF SUPPLY FAN SPEED CONTROL TO ENSURE THAT THE CONTROL SYSTEM CAN MAINTAIN MINIMUM SCHEDULED OUTSIDE AIR FLOW WHEN THE SUPPLY AIR IS AT SCHEDULE MAXIMUM AND MINIMUM FLOW.
- 5. WHEN IN ECONOMIZER MODE THE MIXED AIR DAMPERS SHALL MODULATE TO MAINTAIN MIXED AIR TEMPERATURE AT 60 DEGREES F (ADJUSTABLE) SETPOINT.
- 6. WHEN IN ECONOMIZER MODE THE RETURN FAN SPEED SHALL MODULATE TO MAINTAIN SPACE PRESSURE AT 0.05 INCH WC.
- 7. THE SYSTEM SHALL BE IN ECONOMIZER MODE WHEN THE OUTSIDE AIR TEMPERATURE IS BETWEEN 67 DEGREES F AND 42 DEGREES F.
- J. SUPPLY AIR TEMPERATURE SETPOINT: THE CONTROL SYSTEM SHALL RESET THE SUPPLY AIR TEMPERATURE SETPOINT BASED ON THE FOLLOWING RESET SCHEDULE:
 - OUTDOOR AIR TEMPERATURE SUPPLY AIR SETPOINT 60 F 54 F 55 F 60 F
- K. SUPPLY AIR TEMPERATURE: THE CONTROL SYSTEM SHALL MODULATE THE PRE-HEAT COIL CONTROL VALVE AND CHILLED WATER COIL CONTROL VALVES IN SEQUENCE TO MAINTAIN SUPPLY AIR TEMPERATURE AT SETPOINT.
- L. HUMIDIFIER CONTROL:
- 1. THE CONTROL SYSTEM SHALL MODULATE THE HUMIDIFIER STEAM VALVE TO MAINTAIN EXHAUST AIR RELATIVE HUMIDITY AT 25%.
- 2. THE HIGH LIMIT HUMIDISTAT SHALL SHUTOFF THE HUMIDIFIER STEAM VALVE ANY TIME THE HUMIDITY IN THE SUPPLY AIR DUCT FXCFFDS 70%.
- 3. THE CONTROL SYSTEM SHALL ALARM THE USER INTERFACE ANYTIME EXHAUST AIR HUMIDITY IS BELOW 20%
- M. FILTER MONITORING: THE CONTROL SYSTEM SHALL MONITOR AIR PRESSURE DROP ACROSS EACH FILTER BANK AND RESPOND AS FOLLOWS:
- ALARM WHEN FILTER PRESSURE DROP EXCEEDS MANUFACTURER'S LIMIT. LIMIT TO BE DETERMINED FROM FILTER AND AIR HANDLING UNIT SUBMITTALS AND UPDATED IN CONTROL CONTRACTOR'S SEQUENCE OF CONTROL.
- ALARM WHEN FILTER PRESSURE DROP INDICATES THAT A FILTER IS MISSING FROM THE RACK. SETPOINT PRESSURE TO BE DETERMINED DURING TEST AND BALANCE BY REMOVAL OF A FILTER FROM THE RACK.

- N. ALARMS: THE CONTROL SYSTEM SHALL ALARM THE USER INTERFACE AND TAKE THE INDICATED ACTIONS WHENEVER ANY OF THE FOLLOWING CONDITIONS OCCURS:
- MIXED AIR TEMPERATURE NOT AT SETPOINT FOR 5 MINUTES OR LONGER WHEN UNIT IS IN ECONOMIZER MODE.
- PREHEAT COIL LEAVING TEMPERATURE NOT AT SETPOINT FOR FIVE MINUTES OR LONGER.
- COOLING COIL LEAVING AIR TEMPERATURE NOT AT SETPOINT FOR FIVE MINUTES OR LONGER.
- 4. RETURN AIR RELATIVE HUMIDITY NOT AT SETPOINT FOR 15 MINUTES OR LONGER.
- 5. SUPPLY DUCT STATIC PRESSURE NOT AT SETPOINT FOR 5 MINUTES OR LONGER.
- 6. SPACE PRESSURE NOT AT SETPOINT FOR FIVE MINUTES OR LONGER (WHEN ON ECONOMIZER MODE)
- 7. WHEN THE SUPPLY FAN IS OPERATING IN MANUAL OVERRIDE AS DETERMINED BY FAN OPERATION OUTSIDE THE CONTROL OF THE CONTROL SYSTEM.
- 8. TURN OFF ALL FANS WHEN SUPPLY STATIC PRESSURE AS MEASURED BY DISCHARGE STATIC PRESSURE SENSOR EXCEEDS 3.5" WG.

VIII. SEQUENCE OF CONTROL FOR AH-1-4SRF-3

- A. SUPPLY FAN OPERATING. AND SAFETY CONTROLS SHALL INCLUDE:
 - 1. WALL MOUNTED DISCONNECT VARIABLE FREQUENCY MOTOR SPEED CONTROL DRIVE (VFD)(TOTAL OF TWO VFD'S WITH EACH VFD CONTROLLING
 - TWO SUPPLY FANS) 3. RETURN AIR SMOKE DETECTOR
- 4. SUPPLY AIR SMOKE DETECTOR
- 5. FREEZE PROTECTION THERMOSTAT
- 6. GENERAL FIRE ALARM SYSTEM RELAY
- 7. SUPPLY DUCT HIGH AND RETURN DUCT LOW LIMIT PRESSURE SWITCHES
- B. RETURN FAN OPERATING, AND SAFETY CONTROLS SHALL INCLUDE: WALL MOUNTED DISCONNECT
 - 2. VARIABLE FREQUENCY MOTOR SPEED CONTROL DRIVE (VFD)(TOTAL OF TWO VFD'S WITH EACH VFD CONTROLLING

TWO RETURN FANS)

- 3. RETURN AIR SMOKE DETECTOR 4. SUPPLY AIR SMOKE DETECTOR
- 5. FREEZE PROTECTION THERMOSTAT
- 6. GENERAL FIRE ALARM SYSTEM RELAY 7. SUPPLY DUCT HIGH AND RETURN DUCT LOW LIMIT PRESSURE SWITCHES

ACTUATORS SHALL BE PLACED IN THEIR NORMAL POSITION.

- THE DUCT HIGH AND LOW LIMIT PRESSURE SWITCHES, SMOKE DETECTORS, FREEZE PROTECTION THERMOSTAT, AND FIRE ALARM RELAY SHALL BE HARD WIRED IN THE FAN MOTOR CONTROL CIRCUIT AND SHALL SEND A SIGNAL FROM AN AUXILIARY CONTACT TO THE DDC CONTROL SYSTEM. IN ADDITION, THE SMOKE DETECTORS SHALL SEND A SIGNAL TO THE BUILDING FIRE ALARM SYSTEM.
- D. WITH THE SAFETY CONTROLS IN THE NORMAL POSITION AND THE VFD IN THE AUTO POSITION THE FAN MOTORS
- FAN AND CONTROLS INTERLOCK: WHENEVER THE FANS ARE OFF AS INDICATED BY NO AIRFLOW, ALL CONTROL

SHALL OPERATE AT ALL TIMES.

- F. SUPPLY FAN SPEED CONTROL: 1. THE DDC SYSTEM SHALL MODULATE THE VFD OUTPUT TO MAINTAIN SUPPLY DUCT STATIC PRESSURE AT
 - 2. THE CONTROL SYSTEM SHALL RESET THE SUPPLY DUCT STATIC PRESSURE SETPOINT BASED ON THE POSITION OF THE VAV TERMINAL DAMPERS. EVERY 15 MINUTES (ADJUSTABLE) THE CONTROL SYSTEM SHALL LOWER THE SETPOINT BY 5% (ADJUSTABLE) IF AT LEAST ONE TERMINAL IS AT MINIMUM POSITION AND NO TERMINALS ARE FULLY OPEN. IF AT LEAST ONE TERMINAL IS FULLY OPEN THE CONTROL SYSTEM SHALL INCREASE THE SETPOINT BY 5% (ADJUSTABLE).
- G. MIXED AIR SECTION AND RETURN FAN CONTROL:
- 1. THE MIXED AIR SECTION SHALL OPERATE IN MINIMUM OUTSIDE AIR MODE OR ECONOMIZER MODE WHEN IN MINIMUM OUTSIDE AIR MODE THE CONTROL SYSTEM SHALL PLACE THE MIXED AIR DAMPERS IN THEIR MINIMUM OUTSIDE AIR MODE POSITION AND SHALL MODULATE THE RETURN FAN SPEED TO MAINTAIN THE MIXED
- AIR SECTION STATIC PRESSURE AT SETPOINT. 3. THE TAB CONTRACTOR SHALL DETERMINE AND CALIBRATE THE MIXED AIR SECTION DAMPERS MINIMUM OUTSIDE AIR MODE POSITIONS AND MIXED AIR SECTION STATIC PRESSURE SETPOINT SUCH THAT THE PRESSURE CAN BE MAINTAINED THROUGH THE FULL RANGE OF SUPPLY FAN SPEED CONTROL TO ENSURE THAT THE CONTROL SYSTEM CAN MAINTAIN MINIMUM SCHEDULED OUTSIDE AIR FLOW WHEN THE SUPPLY AIR IS AT SCHEDULE
- MAXIMUM AND MINIMUM FLOW. 4. WHEN IN ECONOMIZER MODE THE MIXED AIR DAMPERS SHALL MODULATE TO MAINTAIN MIXED AIR TEMPERATURE
- AT 54 DEGREES F SETPOINT. 5. WHEN IN ECONOMIZER MODE THE RETURN FAN SPEED SHALL MODULATE TO MAINTAIN SPACE PRESSURE AT
- 0.05 INCH WC. 6. THE SYSTEM SHALL BE IN ECONOMIZER MODE WHEN THE OUTSIDE AIR TEMPERATURE IS 67 F OR LOWER FOR 15 MINUTES OR LONGER.
- H. SUPPLY AIR TEMPERATURE: THE CONTROL SYSTEM SHALL MODULATE CHILLED WATER COIL CONTROL VALVE TO MAINTAIN SUPPLY AIR TEMPERATURE AT SETPOINT. SETPOINT SHALL BE 53 F YEAR ROUND.

SUPPLY AIR DUCT EXCEEDS 70%.

- J. HUMIDIFIER CONTROL: 1. THE CONTROL SYSTEM SHALL MODULATE THE HUMIDIFIER STEAM VALVE TO MAINTAIN EXHAUST AIR RELATIVE
- HUMIDITY AT 40%. 2. THE HIGH LIMIT HUMIDISTAT SHALL SHUTOFF THE HUMIDIFIER STEAM VALVE ANY TIME THE HUMIDITY IN THE
- 3. THE CONTROL SYSTEM SHALL ALARM THE USER INTERFACE ANYTIME EXHAUST AIR HUMIDITY IS BELOW 40%.

K. FILTER MONITORING: THE CONTROL SYSTEM SHALL MONITOR AIR PRESSURE DROP ACROSS EACH FILTER BANK AND

- RESPOND AS FOLLOWS: 1. ALARM WHEN FILTER PRESSURE DROP EXCEEDS MANUFACTURER'S LIMIT. LIMIT TO BE DETERMINED FROM FILTER AND AIR HANDLING UNIT SUBMITTALS AND UPDATED IN CONTROL CONTRACTOR'S SEQUENCE OF
- 2. ALARM WHEN FILTER PRESSURE DROP INDICATES THAT A FILTER IS MISSING FROM THE RACK. SETPOINT PRESSURE TO BE DETERMINED DURING TEST AND BALANCE BY REMOVAL OF A FILTER FROM THE RACK.

FINAL SUBMITTAL OFFICE OF

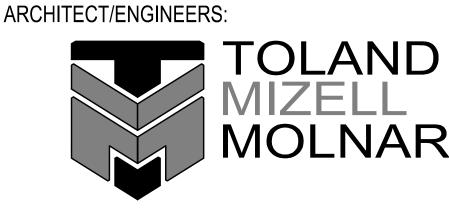
CONSTRUCTION

AND FACILITIES

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667-083 SEQUENCE OF CONTROLS **EXPAND RADIOLOGY AND SPS MECHANICAL OVERTON BROOKS VAMC** oproved: Project Director awing Number: SHREVEPORT, LA VA U.S. Department of Veterans Affairs 04-17-2015

£44